

REMARKS

Claims 1, 3, 6, 9-11, and 15 are amended, claims 4-5 and 7-8 are canceled in this response, and claims 81-85 are added; as a result, claims 1, 3, 6, 9-13, 15-17, 23-30, 48-54, 57-58, and 81-85 are now pending in this application.

No new matter has been added through the amendments to claims 1, 3, 6, 9-11, and 15. Support for the amendments to claims 1, 3, 6, 9-11, and 15 may be found throughout the specification, including but not limited to the specification at page 4, line 18 through page 5, line 20, and page 7, line 7 through page 8, line 24.

No new matter has been added through new claims 81-85. Support for new claims 81-85 may be found throughout the specification, including but not limited to the specification at page 7, line 7 through page 8, line 14.

§112 Rejection of the Claims

Claims 11-13 and 15-17 were rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. Applicant has amended both independent claim 11 and independent claim 15 to include:

an insulating layer having a top surface and a final thickness and including a first trench and a second trench.

Applicant believes these amendments to independent claim 11 and to independent claim 15 overcome the 35 U.S.C. § 112, second paragraph rejection of claims 11-13 and 15-17, wherein claims 12-13 depend from independent claim 11 and claims 16-17 depend from independent claim 15. Therefore, Applicant respectfully requests withdrawal of this rejection and allowance of claims 11-13 and 15-17.

§102 Rejection of the Claims

Claims 1 and 3-8 were rejected under 35 U.S.C. § 102(e) for anticipation by Uzoh (U.S. 6,258,707).

Claims 4-5 and 7-8 are canceled, so the rejection of claims 4-5 and 7-8 is moot.

Independent claim 1, and claims 3 and 6 that depend from independent claim 1, are not anticipated by Uzoh because Uzoh fails to teach all of the subject matter included in independent claim 1, as arranged in independent claim 1. Independent claim 1 as now amended includes:

an insulating layer having a top surface and a final thickness;
a trench in the insulating layer, the trench having a width and a depth across the width of the trench, the depth being a **substantially same depth that is less than the final thickness and greater than a critical depth across the width of the trench, wherein the critical depth includes a vertical thickness of a first barrier layer and a vertical thickness of a seed layer and a vertical thickness of a first metal layer and a vertical thickness of a second barrier layer;**
the trench including within the trench and below a level coplanar with the top surface at least and no more than the first barrier layer, the seed layer above the barrier layer, and the first metal layer above the seed layer **when the width of the trench is less than a first critical width defined as twice the sum of a sidewall first barrier layer thickness, sidewall seed layer thickness, and a sidewall first metal layer thickness;** and
the trench including within the trench and below a level coplanar with the top surface at least the first barrier layer, the seed layer above the first barrier layer, the first metal layer above the seed layer, the second barrier layer above the first metal layer, and a second metal layer above the second barrier layer **when the width of the trench is greater than a second critical width defined as twice the sum of the sidewall first barrier layer thickness, the sidewall seed layer thickness, the sidewall first metal layer thickness, and a sidewall second barrier layer thickness.** (Emphasis added).

Thus, independent claim 1 includes, "a substantially same depth that is less than the final thickness and greater than a critical depth across the width of the trench, wherein the critical depth includes a vertical thickness of a first barrier layer and a vertical thickness of a seed layer and a vertical thickness of a first metal layer and a vertical thickness of a second barrier layer."

In contrast, Uzoh concerns a terraced trench,¹ including three terraced sections, or a greater or fewer number of sections may be formed.² However, there is no teaching in Uzoh of

¹ See Uzoh at column 4, lines 4-5.

² See Uzoh at column 4, lines 8-9.

a trench as included in independent claim 1 having a *substantially same depth* that is less than the final thickness and greater than a critical depth across the width of the trench."

Further, there is no teaching in Uzoh of a first critical width and a second critical width, wherein the trench includes, "within the trench and below a level coplanar with the top surface at least and no more than the first barrier layer, the seed layer above the barrier layer, and the first metal layer above the seed layer *when the width of the trench is less than a first critical width*," and including "within the trench and below a level coplanar with the top surface at least the first barrier layer, the seed layer above the first barrier layer, the first metal layer above the seed layer, the second barrier layer above the first metal layer, and a second metal layer above the second barrier layer *when the width of the trench is greater than a second critical width*," all as included in independent claim 1. (Emphasis added).

For at least the reasons stated above, Uzoh fails to teach all of the subject matter included in independent claim 1, and so independent claim 1 is not anticipated by Uzoh.

Claims 3 and 6 depend from independent claim 1, and so include all of the subject matter included in independent claim 1, and more. For at least the reasons stated above with respect to independent claim 1, Uzoh fails to teach the subject matter included in claims 3 and 6, and so claims 3 and 6 are not anticipated by Uzoh.

Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 102(e) rejection, and allowance of claims 1, 3, and 6.

§103 Rejection of the Claims

Claims 9 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Uzoh (U.S. 6,258,707) in view of Leiphart (U.S. 6,833,623).

Claim 9 and independent claim 10 are not obvious in view of the proposed³ combination of Uzoh and Leiphart because the proposed combination of Uzoh and Leiphart fails to teach or suggest the subject matter included in claim 9 and in independent claim 10.

Claim 9 as now amended depends from independent claim 1, and so includes all of the subject matter included in independent claim 1, and more. For at least the reasons stated above with respect to independent claim 1, Uzoh fails to teach or suggest the subject matter included in

³ Applicant does not agree or admit that any combination of Uzoh and Leiphart is possible.

claim 9. Applicant fails to find in, and the Office Action fails to point out in the additional document of Leiphart a teaching or suggestion of the subject matter included in claim 9 and missing from Uzoh. Therefore, the proposed⁴ combination of Uzoh and Leiphart fails to teach or suggest the subject matter included in claim 9, and so claim 9 is not obvious in view of the proposed combination of Uzoh and Leiphart.

Independent claim 10 as now amended includes:

- a first memory cell;
- a second memory cell coupled to the first memory cell through the interconnect;
- the interconnect having an insulating layer having a top surface and a final thickness and a trench in the insulating layer, the trench having a width and a depth across the width of the trench, the depth being **a substantially same depth that is less than the final thickness and greater than a critical depth across the width of the trench**, wherein the critical depth includes a vertical thickness of a first barrier layer and a vertical thickness of a seed layer and a vertical thickness of a first metal layer and a vertical thickness of a second barrier layer;
- the trench including within the trench and below a level coplanar with the top surface at least and no more than the first barrier layer, the seed layer above the barrier layer, and the first metal layer above the seed layer **when the width of the trench is less than a first critical width defined as twice the sum of a sidewall first barrier layer thickness, sidewall seed layer thickness, and a sidewall first metal layer thickness**; and
- the trench including within the trench and below a level coplanar with the top surface at least the first barrier layer, the seed layer above the first barrier layer, the first metal layer above the seed layer, the second barrier layer above the first metal layer, and a second metal layer above the second barrier layer when the width of the trench is greater than **a second critical width defined as twice the sum of the sidewall first barrier layer thickness, the sidewall seed layer thickness, the sidewall first metal layer thickness, and a sidewall second barrier layer thickness**.
(Emphasis added).

For reasons analogous to those stated above with respect to independent claim 1, Uzoh fails to teach or suggest all of the subject matter included in independent claim 10. Applicant fails to find in, and the Office Action fails to point out in the additional document of Leiphart, a

⁴ Applicant does not agree or admit that any combination of Uzoh and Leiphart is possible.

teaching or suggestion of the subject matter included in independent claim 10 and missing from Uzoh. Therefore, the proposed⁵ combination of Uzoh and Leiphart fails to teach or suggest the subject matter included in independent claim 10, and so independent claim 10 is not obvious in view of the proposed combination of Uzoh and Leiphart.

Applicant respectfully requests reconsideration and withdrawal of the 35 U.S.C. § 103(a) rejection, and allowance of claim 9 and independent claim 10.

Allowable Subject Matter

Claims 23-30, 48-54, 57, and 58 were allowed. Applicant respectfully acknowledges the allowance of claims 23-30, 48-54, 57, and 58.

New Claims

New claims 81-85 depend from independent claim 1, and so include all of the subject matter included in independent claim 1, and more. For at least the reasons stated above with respect to independent claim 1, new claims 81-85 are novel and non-obvious in view of Uzoh, and any proposed combination of Uzoh and Leiphart.

Applicant respectfully requests consideration and allowance of new claims 81-85.

Reservation of Rights

In the interest of clarity and brevity, Applicant may not have addressed every assertion made in the Office Action. Applicant's silence regarding any such assertion does not constitute any admission or acquiescence. Applicant reserves all rights not exercised in connection with this response, such as the right to challenge or rebut any tacit or explicit characterization of any reference or of any of the present claims, the right to challenge or rebut any asserted factual or legal basis of any of the rejections, the right to swear behind any cited reference such as provided under 37 C.F.R. § 1.131 or otherwise, or the right to assert co-ownership of any cited reference. Applicant does not admit that any of the cited references or any other references of record are relevant to the present claims, or that they constitute prior art. To the extent that any rejection or assertion is based upon the Examiner's personal knowledge, rather than any objective evidence

⁵ Again, Applicant does not agree or admit that any combination of Uzoh and Leiphart is possible.

of record as manifested by a cited prior art reference, Applicant timely objects to such reliance on Official Notice, and reserves all rights to request that the Examiner provide a reference or affidavit in support of such assertion, as required by MPEP § 2144.03. Applicant reserves all rights to pursue any cancelled claims in a subsequent patent application claiming the benefit of priority of the present patent application, and to request rejoinder of any withdrawn claim, as required by MPEP § 821.04.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

HOWARD E. RHODES

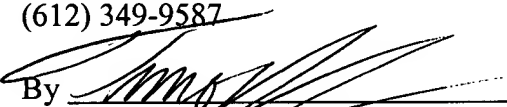
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Date

8 May '07

By


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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 8 day of May 2007.

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